# Dengue in Venezuela

Velasco, Zoraida

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# Health Seeking Behaviour and Treatment Intentions of Dengue and Fever: a Household Survey of Children and Adults in Venezuela

Jelte Elsinga[a], Erley Lizarazo[b], Maria F Vincenti[a,b], Masja Schmidt[a], Zoraida I Velasco-Salas[a,c], Luzlexis Arias[b], Adriana Tami[a,d]

[a]Department of Medical Microbiology, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands; [b]Instituto de Investigaciones Biomédicas, Universidad de Carabobo, Maracay, Venezuela; [c]Departamento de Biología, Facultad Experimental de Ciencia y Tecnología, Universidad de Carabobo, Valencia, Venezuela; [d]Universidad de Carabobo, Departamento de Parasitología, Valencia, Carabobo, Venezuela.

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## ABSTRACT

Dengue in Venezuela is a major public health problem with an increasing incidence of severe cases. Early diagnosis and treatment influences the outcome of dengue illness. We aimed to understand patterns of health seeking behaviour (HSB) in individuals exposed to high dengue incidence in order to improve early attendance to health centres. Between September 2013 and February 2014 a cross-sectional household survey was performed in Maracay, Venezuela. Intended HSB of adults and parents/guardians was assessed. Data was collected by structured questionnaires from 105 individuals. Intended pathways to care differed for suspected dengue compared to fever, and between children and adults. In case of fever, most individuals would firstly treat at home before seeking medical care, while the contrary was reported in case of suspected dengue. Parents/guardians would take children earlier to the health facility than adults. Suspected dengue would prompt people to search medical help earlier than for fever ($P<0.001$). For dengue, the appearance of new symptoms (77.1%) and high fever (74.3%) were the main reasons for seeking medical help. Primary health centres were the first intended choice to find medical care for nearly (93%) all participants. Dengue risk perception was high with a relative good general dengue knowledge. Delay in care-seeking is found to be significantly associated with severe dengue. Our study shows that intentions to seek medical help differed between fever or suspected dengue. Improving the knowledge and awareness of dengue symptoms may enhance early attendance to medical care of affected populations.

# 1. Introduction

Dengue fever, a viral vector-borne disease spread by the day-biting mosquito *Aedes aegypti*, is a global health problem of increasing importance (1). Currently, dengue affects over 2.5 billion people living in dengue endemic areas, which comprises 40% of the world's population (2). According to estimations of the WHO, 50-100 million dengue infections occur every year, leading to 500 000 cases of severe disease that need hospitalisation (2). However, recent estimations speak of approximately 400 million dengue infections annually (3). Where in the 1950s dengue cases were reported in only nine countries, today more than 125 countries in the tropics and subtropics are endemic for dengue (4). In the Americas, almost all countries struggle with recurrent epidemics (5). The poverty, poor sanitation and overcrowding that accompanies the uncontrolled urbanisation in this region creates environments in favour of vector-breeding and rapid spread of the virus, which leads to serious obstacles in disease control (6).

Dengue has become a major public health problem in Venezuela, with epidemics of increasing magnitude regularly occurring against a background of an established endemic situation. Initial descriptions of dengue-like illness in Venezuela based on clinical manifestations date from 1828 and 1946 (7). Since the first dengue hemorrhagic fever epidemic reported in the country in 1989-1990 and the second in the Americas (8), the frequency of severe cases has increased. Between 1989 and 2007, the highest proportion (35%) of severe dengue cases within the Americas were reported in Venezuela (4). In effect, dengue transmission in Venezuela has become perennial with poverty-related socio-economic factors and behavioural determinants fuelling the increasing incidence of dengue in the urban areas of the country (9)(Velasco *et al*., in press).The most recent and largest dengue outbreak took place in 2010 with more than 120.000 reported cases, of which 8% represented severe cases (10).

Early diagnosis and adequate supportive care are of great importance in the management of dengue so as to avoid the development of severe disease. Thereby, early treatment intervention can reduce the case fatality rate from 20% to 1% or less (1,11). While knowledge and possibilities to diagnose and treat dengue fever increase, efforts have to be made to make these new developments accessible for those who have a dengue infection. An important factor to be taken into consideration is the patient's health seeking behaviour (HSB), because for early diagnosis and supportive care, people must have the intention and the means to seek medical care early in the disease (12). Therefore, local studies on health believe and practice, HSB and access to care with respect to dengue fever are needed to identify opportunities for applying these new developments in diagnostics and treatment (13). Insights in HSB of dengue could help to attain a reduction of late diagnosis, an increase of treatment adherence and improvement of health promotion strategies applied to a specific culture (14).

In Venezuela, patients with a suspected dengue infection tend to seek medical help beyond the third day after the onset of fever (15). At this time, the patient may be already critically ill (16). Delay in care-seeking is found to be significantly associated with severe dengue (17), which stresses the importance of understanding HSB and access to care for dengue patients. However, research on HSB applied to dengue appears to be scarce, especially in the Americas, for the majority of studies on this topic have been performed in Asia (12, 18-23).

This study aims to understand the patterns of HSB in the Venezuelan population exposed to high dengue incidence in order to find ways to improve early attendance to health centres and medical care. We compared HSB intentions of adults and of parent/guardians with respect to their children in the case of fever or suspected dengue. By using both quantitative and qualitative data we aim to present a better insight in social, psychological and cultural motives of the intended behaviour and attitudes.

## 2. Materials and Methods

### 2.1. Study Site

In August 2010 a prospective, community-based cohort study was set up in Maracay, Aragua state, Venezuela to understand dengue temporo-spatial spread and estimate dengue incidence (Velasco *et al*., in press). Aragua state witnessed the highest incidence of dengue in Venezuela in 2012, reaching nearly 7000 reported cases of which 2% were severe (10). Maracay is one of the largest cities of Venezuela with dengue hyper-endemicity (9, 24). It is the capital of Aragua state with an estimated of 1.300.000 inhabitants (25). There are two seasons, a dry (November-April) and a rainy season (May-October). The temperature ranges from 25°C to 35°C with a mean annual precipitation of 834 mm (26). Within Maracay, three neighbourhoods called Candelaria, Caña de Azúcar and Cooperativa were selected for their high dengue incidence (9) (LARDIDEV, personal communication). Candelaria and Caña de Azúcar are located close to each other in the north-westerly area of Maracay, while Cooperativa is situated in the north-east. All are served by public (governmental) primary and secondary health centres. Patients that require further specialised treatment are referred to the main public tertiary level hospital, the Hospital Central de Maracay.



### 2.2. Study Design

Between August 2010 and January 2011, 2014 individuals in the age range of 5-30 years old living in 840 households were enrolled in a community-based prospective cohort study through house-to-house visits (Velasco *et al*., in press). Participants

are followed through active and passive surveillance. Annual surveys are performed to estimate the incidence of dengue and to assess the temporo-spatial dynamics of dengue transmission.

The present study was carried out during the annual survey that took place between September 2013 and February 2014. A cross-sectional survey of a randomly chosen sub-sample of the cohort participants was carried out to gather quantitative and qualitative data on HSB intentions at community level of the general population exposed to dengue.

## 2.3. Study population

A randomized sub-sample of approximately 100 households included in the cohort study was selected. One individual was interviewed in each household. The intention was to interview an equal number of adults and parents or guardians of children (<18 years old) who were already participating in the cohort study. Adults (18 years and older) were randomly chosen from all present adults at the moment of visiting the selected households.

## 2.4. Data Collection

A structured questionnaire, the HSB-questionnaire, was developed containing pre-coded and open questions on socio-demographic and socio-economic details, knowledge of dengue symptoms and dengue transmission, risk perception, pathways of HSB in relation to presenting fever and suspicion of dengue infection, and finally individuals were asked to rank the quality of available health centres in their area. With respect to the parents/guardians interviewed, questions on HSB and risk perception referred to the child, while adults were interviewed with respect to their own knowledge, attitudes and practices. The questionnaires were prepared in English, translated to Spanish, pre-tested and adapted in a pilot study. Data on mosquito preventive practices and other socio-economic variables were collected from a household questionnaire which was applied as part of the annual survey of the cohort study.



*a) Socio-Demographic and Socio-Economic Characteristics*

From the HSB-questionnaire we gathered demographic characteristics of the interviewed person: age, place of residence (neighbourhood), level of education, occupation, religion, and (in case of a child-questionnaire) the identification code of the child(ren) from the cohort study. Additional socio-economic data was gathered in the household questionnaire, and included characteristics of the residence (type of residence, number of persons living in the household, number of rooms (bathrooms

not included), roof type, floor material, what materials were used to separate sleeping rooms from the rest of the household (wooden doors, curtains, nothing, etc), availability of all public services (tap water, electricity, gas and garbage collection), total income per household, ownership of 19 different items (TV, DVD, computer, cable-TV, internet, washing machine, dryer, gas stove, electric stove, water heater, fridge, microwave, landline telephone, portable plug-in telephone, mobile phone, air-conditioning, car, motorcycle, bicycle). Socio-economic data was used as proxy markers to estimate socio-economic status of the individuals.

*b) Knowledge of Dengue Infection*

Dengue knowledge was assessed during the interview by asking the following: having heard about dengue and from which sources, a 9-item question about dengue transmission and a 16-item question about dengue symptoms. Firstly, respondents were asked the open question: "how do you think people get infected by dengue?". Their 'self-mentioned' answers were recorded according to the 9 pre-coded modes of transmission and those not matching these, were written down. Subsequently individuals were prompted to state if the pre-coded modes of transmission were true-or-false statements. The same methodology was used to assess knowledge on dengue symptoms. The pre-coded transmission routes included: bite of a mosquito, touching other people, being near to a dengue patient, coughing/sneezing, kissing, bad hygiene, sexual intercourse, being at health centres, and via spiritual beings. Pre-coded symptoms were: fever, headache, eye pain, body pain, face redness/rash, muscle pain, abdominal pain, runny nose, sore throat, vomiting, coughing/sneezing, diarrhoea, malaise, nausea, constipation, bleeding. If an answer was 'self mentioned' 2 points were granted, if a prompted question item was answered correctly with 'yes' or 'no' 1 point. If the question item was answered with 'don't know', 0 points were given. Wrong answers scored minus 2 points when 'self mentioned' and minus 1 point when prompted. A 'transmission knowledge score' (maximum score: 10 points) and a 'symptom knowledge score' (maximum score: 30 points) was derived by adding the points obtained from each question respectively. Finally, an 'Overall knowledge score' (maximum score: 40 points) totalised the sum of both scores. Based on their score the respondents were divided in three categories (poor, medium or good knowledge). We defined seven symptoms as typical dengue symptoms: fever, eye pain (retroocular pain), headache, face redness/rash, vomiting, muscle/joint pain and bodily pain. Abdominal pain, bleeding and vomiting were defined as warning symptoms for severe disease but we did not ask specifically for warning symptoms. The typical and warning symptoms were 'recognised' if they were self-mentioned or if they were answered with 'yes' after a true-or-false statement.

*c) Behavioural Characteristics*

The behavioural characteristics were asked through open questions: 'what would you do if you/your child had fever'; and 'what would you do if you think that you/your child have/has dengue'. Pre-coded options were the possible most frequent options people would choose as their first and subsequent actions: a) staying and treat at home ('home treatment'), b) 'visit a medical doctor', c) 'alternative treatment' (alternative medicine practitioner, traditional healer, community leaders, friends), d) 'call a medical doctor', e) 'another action', or f) 'no action'. After each action mentioned, the person was asked: 'would you do anything else?' If 'home treatment' was mentioned, respondents were asked to specify the type of home treatment. If 'go to the doctor' was mentioned, they were asked when and to which health centre they would choose to go and if they would visit other health centres if needed.

After asking if the interviewed individual chose to seek a medical doctor in the case of a possible dengue infection, we enquired what would make him/her decide to seek medical help. Possible pre-coded options were: the number of days of fever, temperature of the fever, the appearance of new symptoms or another reason (which was written down). If any of the first three options was mentioned, respondents were asked to specify the number of days, degree of temperature and type of symptoms.

*d) Risk Perception*

Perception of the risk of acquiring a dengue infection (either referred to children or adults) was assessed during the interview, as well as the reasons for feeling or not at risk. These reasons were summarised and categorised.

*e) Logistics, Quality of Health Centres and Preventive Practices*

The health care system in Venezuela is comprised of a public and a private sector both under the umbrella of the Ministry of Health. The public sector was designed to offer care and most medicaments for free. It has a network of urban and rural out-patient health centres at primary and secondary level named "Ambulatorios tipo I or tipo II". Patients that cannot be managed as out-patients, are referred to tertiary level health centres or hospitals. The main public referral hospital in Maracay city is the Hospital Central de Maracay. The private sector comprises private practices and private hospitals were patients need to pay either via their health insurance or directly. In 2003, the government created a parallel public health care program under the name "Misión Barrio Adentro" (27). Within this program, a network of out-patient health facilities at

primary level were created (Ambulatorio 'Barrio Adentro') to reach communities with limited access to health care. In a second step, diagnostic centres or "Centros de Diagnóstico Integral" (CDI) and rehabilitation centres were set up.

During the interview we asked which specific health centre individuals would attend in case of dengue (referring to child or adult), referring to six different Venezuelan types of health centres. These were: a) Ambulatorio, a public primary level out-patient health care facility; b) Hospital, referring to a public tertiary level hospital; c) Ambulatorio 'Barrio Adentro', referred in our study as "Ambulatorio BA"; d) CDI; e) Private practice; and f) Private hospital. People were also asked to assess the quality of care they perceived they would receive in each type of health centre (1= very poor; 2= poor; 3= average; 4= good; 5= very good). From the household questionnaire, data on means of transport to the health centre, and the time and costs of transport, were derived. Data on preventive practices against mosquitoes was also derived from the household questionnaire.

*f) Qualitative Data*

During the interview, some individuals gave explanations to the answers they gave. In other occasions we asked the individual to explain the reasons for their answer(s). Questions asked and answers given were written down and used in the analysis.

## 2.5. Data Analysis

Information collected in the questionnaires was entered into a database using Epi Info (Epi InfoTM, version 3.5.4). Data was checked for consistency and analysed anonymously.

Differences in proportions were analysed using a chi-square test or Fisher's exact test when applicable. Continuous variables were converted into ordered categorical variables when suitable. For normally distributed quantitative data, means were compared using Student's t-test. If the quantitative data was not normally distributed, a Mann-Whitney U test was used. A Wilcoxon signed rank test was used for comparing related means within individuals when comparing HSB of fever and dengue while pair-wise proportions were compared with a McNemar's test. Significance was determined at 5% level. By using principal components analysis (28, 29), the socio-economic variables were weighted to obtain a relative measure. Based on this relative score individuals were divided into low, average and high socio-economic status. The socio-economic variables used for this analysis were those related to their possessions (except of TV since this variable showed no variance), type of house, total household income, crowding (number of persons per room), material of the roof, material of the floor, door materials. Data was analyzed using SPSS (SPSS Inc., version 20.0, Chicago, Illinois) and STATA (Stata Statistical Software: Release 10. College Station, TX,) software.

### 2.6. Ethic Statement

The study was approved by the Ethics Review Committee of the Biomedical Research Institute, Carabobo University (Aval Bioetico #CBIIB(UC)-014), Maracay, Venezuela, the Ethics, Bioethics and Biodiversity Committee (CEBioBio) of the National Foundation for Science, Technology and Innovation (FONACIT) of the Ministry of Science, Technology and Innovation, Caracas, Venezuela; and by the Regional Health authorities of Aragua State (CORPOSALUD Aragua). All adult participants signed written informed consent, and a parent or guardian of any child participant provided written informed consent on their behalf. Children between 8 and 17 years old provided written informed assent.

## 3. Results

Between September 2013 and February 2014, we conducted a cross-sectional study within the third annual survey of a dengue community-based cohort study in three neighbourhoods of Maracay city, Venezuela. We aimed to understand the health seeking behaviour (HSB) and access to care of a population exposed to endemic dengue transmission. Individual and household-related interviews were conducted targeting adults and parents/guardians of children living in the area of study. Overall, 105 individuals were interviewed on HSB of which 54 referred to adults and 51 to children. In addition, 92 household socio-economic questionnaires were applied.

### 3.1. General Description of the Study Population

Table 1 shows a summary of the general characteristics of the study population and compares individuals interviewed with the adult versus the child questionnaire. The 105 interviewed individuals had a mean age of 40 years (range: 18 – 87) and were mostly females (Table 1). Parents/guardians of children were older than those interviewed with the adult questionnaire (mean age 44 vs. 35 years respectively; $P<0.001$). This was expected, as those who care for the children were mainly mothers or grandmothers while the majority of those interviewed with the adult questionnaire were younger than 30 years (Table 1). Most of the interviewed individuals lived in Candelaria. We were unable to complete the planned interviews in the other two neighbourhoods (Cooperativa and Caña de Azúcar) because of violence during anti-governmental protests in February and March 2014 in the country. The majority of the interviewed individuals completed secondary school and were housewives or domestic workers. Those interviewed with the adult questionnaire had a higher education level and consisted of a bigger proportion of students than parents/guardians of children. As in the rest of the country, the majority of the individuals professed a catholic religion. Atheists were less common within respondents of the child questionnaire ($P=0.043$). The majority of interviewed

individuals lived in households with 5-6 rooms and most households were occupied by more than 5 inhabitants. Households of parents/guardians of children were more crowded than those of the ones interviewed with the adult questionnaire (P=0.041). The households of respondents of the adult questionnaire had a higher monthly income (P=0.020) and a higher socio-economic status (Table 1).

## 3.2. Knowledge, Risk Perception and Influence of a Past Dengue Infection

The majority of interviewed individuals (103/105) indicated that they had heard about dengue. The main sources of information were the television (56.2%), and the health centres (43.8%). Other frequently mentioned sources were friends/family/neighbours, newspapers, school/university and information campaigns from the Ministry of Health (28%-34%). Radio, internet, brochures and our cohort study (where written and oral information on dengue was provided) were less frequently mentioned.

### a) *Knowledge of Dengue Transmission*

The interviewed individuals showed a relative good knowledge of dengue transmission. There was no statistically significant difference in transmission knowledge between the interviewed parents/guardians and adults (Table 2). In response of the open question, most individuals (100/105, 95.2%) self-mentioned ‘the bite of a mosquito’ as the transmission source. There was one person who self-mentioned that kissing could transmit dengue, another one mentioned accumulation

## Table 1.- Socio-demographic and socio-economic characteristics of interviewed individuals

| | Total (n=105) | | Child (n=51) | | Adult (n=54) | | |
|---|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) | P-value[a] |
| **Age** (n=103) | | | | | | | |
| 18-30 | 39 | (37.9) | 8 | (16.3) | 31 | (57.4) | |
| 31-50 | 34 | (33.0) | 25 | (51.0) | 9 | (16.7) | |
| >50 | 30 | (29.1) | 16 | (32.7) | 14 | (25.9) | <0.001 |
| **Sex** (n=105) | | | | | | | |
| Females | 91 | (86.7) | 47 | (92.1) | 44 | (81.5) | |
| Males | 14 | (13.3) | 4 | (7.8) | 10 | (18.5) | 0.108 |
| **Place of residence** (n=105) | | | | | | | |
| Candelaria | 72 | (68.6) | 36 | (70.6) | 36 | (66.7) | |
| Cooperativa | 11 | (10.5) | 4 | (7.8) | 7 | (13.0) | |
| Caña de Azúcar | 22 | (21.0) | 11 | (21.6) | 11 | (20.4) | 0.693 |
| **Education** (n=104) | | | | | | | |
| Illiterate/ pre or primary school[b] | 17 | (16.3) | 11 | (21.6) | 6 | (11.3) | |
| Secondary school | 54 | (51.9) | 31 | (60.8) | 23 | (43.4) | |
| University/ university polytechnic | 33 | (31.7) | 9 | (17.6) | 24 | (45.3) | 0.009 |
| **Occupation** (n=104) | | | | | | | |
| Student | 16 | (15.4) | 4 | (7.8) | 12 | (22.6) | |
| Housewife/Domestic worker | 52 | (50.0) | 32 | (62.7) | 20 | (37.7) | |
| Manual worker | 4 | (3.8) | 2 | (3.9) | 2 | (3.8) | |
| Merchant/ Employee/ Office worker | 27 | (26.0) | 12 | (23.5) | 15 | (26.0) | |
| Professional/ University staff | 5 | (4.8) | 1 | (2.0) | 4 | (4.8) | 0.065 |
| **Religion** (n=101) | | | | | | | |
| No religion | 6 | (5.9) | 0 | (0.0) | 6 | (11.3) | |
| Catholic | 79 | (75.2) | 37 | (77.1) | 76 | (73.6) | |
| Christian/Protestant/Evangelist | 17 | (18.8) | 11 | (22.9) | 19 | (15.1) | 0.043 |
| **Availability of complete public services** (n=91) | | | | | | | |
| No | 4 | (4.4) | 3 | (6.8) | 1 | (2.1) | |
| Yes | 87 | (95.6) | 41 | (93.2) | 46 | (97.9) | 0.350 |
| **Persons per household** (n=87) | | | | | | | |
| 2-4 | 25 | (28.7) | 11 | (27.5) | 14 | (29.8) | |
| 5-6 | 28 | (32.2) | 12 | (30.0) | 16 | (34.0) | |
| ≥7 | 34 | (39.1) | 17 | (42.5) | 17 | (36.2) | 0.831 |
| **Household rooms**[c] (n=90) | | | | | | | |
| 2-4 | 35 | (38.9) | 21 | (47.7) | 14 | (30.4) | |
| 5-6 | 42 | (46.7) | 18 | (40.9) | 24 | (52.2) | |
| ≥7 | 13 | (14.4) | 5 | (11.4) | 8 | (17.4) | 0.234 |
| **Crowding (persons/room)** (n=86) | | | | | | | |
| <1.50 | 57 | (66.3) | 20 | (50.0) | 37 | (80.4) | |
| ≥1.50 | 29 | (33.7) | 20 | (50.0) | 9 | (19.6) | 0.003 |
| **Monthly income (VEB)** (n=76) | | | | | | | |
| ≤3000 VEB (minimum wages) | 11 | (14.5) | 8 | (20.5) | 3 | (8.1) | |
| 3001-6000 VEB | 23 | (30.3) | 18 | (46.2) | 5 | (13.5) | |
| >6000 VEB | 42 | (55.3) | 13 | (33.3) | 29 | (78.4) | <0.001 |
| **Socio-economic status** (n=90) | | | | | | | |
| Low | 38 | (42.2) | 23 | (52.3) | 15 | (32.6) | |
| Average | 30 | (33.3) | 17 | (38.6) | 13 | (28.3) | |
| High | 22 | (24.4) | 4 | (9.1) | 18 | (39.1) | 0.004 |

[a]P-value corresponds to the comparison between the child and adult questionnaire responses. [b]From the total sample, there was one person illiterate. [c]Number of rooms, bathrooms not included.

of garbage. With respect to the true or false questions dengue was believed to be transmitted through 'health centres' (21%) and 'bad hygiene' (21%), as well as via 'sneezing/coughing' (16%) and 'kissing' (13%). The majority of the people (57%) did not give wrong answers with respect to the transmission knowledge questions for both the open and true or false questions.

b) *Knowledge of Dengue Symptoms*

Fever was the most frequent self-mentioned symptom, 97% of the individuals mentioned this symptom without prompting. Headache (57%), muscle/joint pain (34%), malaise (34%), body pain (31%), redness in face/rash (31%) and vomiting (30%) were other frequent self-mentioned symptoms. Those that were not recognized as dengue symptoms by the interviewed individuals were sore throat (48% of the individuals), diarrhoea (44%), nausea (41%) and vomiting (36%). The seven typical dengue symptoms were fully 'recognized' (either self-mentioned or prompted) by 28% of the people, and the three dengue warning symptoms by 27% of the respondents. Contrary to the transmission knowledge score, there was a poorer knowledge in the study population with regard to dengue symptomatology as 73% of the individuals scored a poor or medium symptom knowledge score. Although there was not a statistically significant difference between the adult and child interview, those who answered the adult questionnaire seemed to have a poorer knowledge compared to parents/ guardians (Table 2). We compared the means of mentioned information sources for dengue within the categories of the knowledge score with a Kruskal-Wallis test to see whether knowledge was associated with the amount of information sources reported. People with better transmission knowledge scores reported more information sources for dengue (P=0.068) and those with better symptom knowledge mentioned also more information sources (P=0.220). There was a significant association observed (P=0.038) when comparing the number of the reported information sources with the total knowledge score, showing a mean of reported information sources of respectively 2.3 (poor knowledge), 2.5 (medium knowledge), 2.9 (good knowledge). While people who reported more typical dengue symptoms heard from dengue from more information sources (P=0.007), there was no significant association found with respect to dengue warning symptoms (P=0.179).

**Table 2.- Knowledge and risk perception**

| | Total (n=105) | | Child (n=51) | | Adult (n=54) | | |
|---|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) | P-value[a] |
| **Transmission score** (max=10) | | | | | | | |
| Poor (<7) | 25 | (23.8) | 11 | (21.6) | 14 | (25.9) | |
| Medium (7-9) | 20 | (19.0) | 6 | (11.8) | 14 | (25.9) | |
| Good (10) | 60 | (57.1) | 34 | (66.7) | 26 | (48.1) | 0.103 |
| **Symptom score (**max=30) | | | | | | | |
| Poor (≤9) | 32 | (30.5) | 13 | (25.5) | 19 | (35.2) | |
| Medium (10-13) | 45 | (42.9) | 21 | (41.2) | 24 | (44.4) | |
| Good (≥14) | 28 | (26.7) | 17 | (33.3) | 11 | (20.4) | 0.283 |
| **Overall knowledge score (**max=40) (n=105) | | | | | | | |
| Poor (≤17) | 32 | (30.5) | 10 | (19.6) | 22 | (40.7) | |
| Medium (18-22) | 37 | (35.2) | 21 | (41.2) | 16 | (29.6) | |
| Good (≥23) | 36 | (34.3) | 20 | (39.2) | 16 | (29.6) | 0.063 |
| **Typical dengue symptoms**[b] | | | | | | | |
| Reported ≤5 | 37 | (36.3) | 17 | (34.7) | 20 | (37.7) | |
| Reported 6 | 36 | (35.3) | 17 | (34.7) | 19 | (35.8) | |
| Reported 7 (all) | 29 | (28.4) | 15 | (30.6) | 14 | (26.4) | 0.890 |
| **Dengue warning symptoms** | | | | | | | |
| Reported ≤2 | 77 | (73.3) | 35 | (68.6) | 42 | (77.8) | |
| Reported 3 (all) | 28 | (26.7) | 16 | (31.4) | 12 | (22.2) | 0.201 |

[a]P-value corresponds to the comparison between the child and adult questionnaire responses. [b]Total sample: n=102, child sample n=49, adult sample: n=53.

c) *Risk Perception*

The majority of the individuals (73/105; 69.5%) reported to feel at risk of dengue and 2 (1.9%) individuals did not know. Almost all individuals (103/105, 98.1%) also believed that people could die from dengue disease. Feeling at risk was equally reported when referred to children and adults (14/51; 72.5% vs. 16/52; 69.2%; P=0.711). Reasons for feeling or not at risk were categorized in Table 3. The most frequently mentioned reason to feel at risk was the presence of mosquitoes in the household (n=46; 63.0%), while the presence of stagnant water (37.0%) and dengue cases nearby (28.8%) were other common reasons to feel at risk. Living near to mountains/hills were also reported as reasons to feel at risk of acquiring dengue. Other mentioned reasons for feeling at risk were 'there are mosquitoes at school', 'presence of dark places', 'the necessary

measures to fight dengue are not being taken', 'children don't care about mosquitoes', 'dengue is in the environment'. The most frequently mentioned reason for not feeling at risk was the absence of stagnant water or uncovered water storage (n=10; 33.3%). People also reported that the usage of protection against the mosquitoes (30.0%) and the absence of rubbish (30.0%) made them feel they were not at risk of getting dengue. Other mentioned reasons for not feeling at risk were 'I am immune to dengue', 'I scare mosquitoes', 'There are no mountains near' and 'I don't have a garden'. The most important reasons which both influenced feeling at risk and feeling not at risk for was the presence/absence of mosquitoes in the household, followed by the presence/absence of stagnant/stored water and presence/absence of nearby dengue cases.

**Table 3.- Reasons for feeling or not feeling at risk of dengue infection.**

| **Reasons for feeling at risk** | | | **Reasons for not feeling at risk** | | |
|---|---|---|---|---|---|
| *Mentioned reasons* | n | (%)[a] | *Mentioned reasons* | n | (%)[a] |
| Mosquitoes in the household | 46 | (63.0) | No (uncovered/stagnant) water around | 10 | (33.3) |
| Presence of stagnant/ stored water | 27 | (37.0) | Usage of protection against mosquitoes | 9 | (30.0) |
| Dengue cases in the vicinity | 21 | (28.8) | No rubbish nearby | 9 | (30.0) |
| Mountains/hills nearby | 14 | (19.2) | No dengue cases nearby | 7 | (23.3) |
| Rubbish nearby | 14 | (19.2) | No mosquitoes in the household | 6 | (20.0) |
| Rain | 5 | (6.8) | No breeding sites around | 6 | (20.0) |
| Canal/River nearby | 5 | (6.8) | Other | 4 | (13.3) |
| Other | 15 | (20.5) | | | |

[a]Proportions within the population who felt (n=73)/ did not feel (n=30) at risk of dengue.

d) *Preventive Measures Against Mosquitoes*

Data on practices to prevent mosquito bites were collected from 91 individuals, of which 17 (18.7%) reported that protection against mosquitoes was not being used in the household. Most household inhabitants used repellents (n=44; 48.4%) and insecticides (n=39; 42.9%). Less frequent reported preventive measures were the usage of mosquito nets (12%), ventilator or air-conditioning (15%), mosquito repellent vaporizer (11%), burning paper/cardboard (9%), repellent plants (5%), windows/doors screening (5%) and other (10%). Repellent oils, infusions, incense, closing the house and electric rackets were placed within the category 'other'. The amount of preventive practices

varied from 0-5 per household, with a mean of 1.6. Feeling at risk of contracting dengue did not influence the amount of preventive measures (P=0.715).

e) *Reporting a Past Dengue Infection*

Out of 103 respondents, 33 (32.0%) mentioned that they/their child(ren) had dengue in the past while one person did not know. Although dengue was reported more frequently when referred to children than adults (36.0% vs. 28.8% respectively) the difference was not significant (P=0.440). People who reported a past dengue infection (referring either to themselves or their children) were higher educated (P=0.033) and had a lower age (mean age: 34 years vs. 42 years; P=0.032). We explored if reporting a past dengue infection influenced dengue knowledge, risk perception and mosquito preventive practices overall. Although there was a higher proportion of individuals with a 'good' transmission knowledge score among those who reported a past dengue infection compared to those who did not (23/33; 69.7% vs. 35/69; 50.7%; P=0.070), the difference was not statistically significant. Reporting a past dengue infection seemed not to influence any of the knowledge scores nor the recognition of typical/warning symptoms overall. However, individuals who had reported a past dengue infection felt that they or their children were more at risk of dengue (n=28; 85% vs. n=44; 65%; P=0.036) and used more preventive practices in their household (mean: 2.11 vs. 1.37; P=0.038).

## 3.3. Intended Health Seeking Behaviour Pathways in the Case of Fever or Dengue

In order to understand the steps people would take in their search for health care, interviewees were confronted with the open questions: 'what would you do if you/your child had fever'; and 'what would you do if you think that you/your child have/has dengue'. Measuring the temperature with a thermometer was one of the first actions taken by 15 (23.8%) respondents in case of fever and 9 (14.3%) respondents in suspected dengue out of the 105 individuals interviewed.

In the case of fever, most people chose to first treat fever at home (88/105; 83.8%) versus only 12 (11.4%) who mentioned that they would first seek medical help. In the case of dengue, the opposite was observed: most people would first visit a doctor (63/105; 60%), while nearly a third decided they would first treat dengue at home (31/105; 29.5%). Less frequently proposed initial actions in the case of fever were 'performing blood tests' (usually referring to a full blood count or platelet count), 'inform my/the mother', 'rest', while 2 adults decided they would take no action with as reasons 'I will recover myself', 'There is no need for visiting a doctor in case of fever' and 'I don't like

doctors'. Other first intended actions mentioned with respect to dengue were 'to perform blood tests', 'call a medical doctor', 'visit an alternative doctor (not further specified)' and 'other' (inform mother, change the clothes of the child and use a mosquito net, call the dengue project staff, evaluate the disease). There were people who mentioned to do a blood test before going to the doctor. A 25 years old business woman and mother of a 9 years-old explained this, referring to her daughter: *"When I go to the doctor, he will tell me to go to a laboratory to do blood tests. If I do a blood test before going to the doctor, this will save me the cost of one consultation."* This woman told us she would test for platelets when asked what she would do if she thought her daughter would have dengue.

The first three steps individuals anticipated to take in the circumstance of fever or dengue, stratified by behaviour in case of adults or children are presented as a flowchart in Figure 1. Only the pathways that begin with either 'home treatment' or 'visit medical doctor' are shown, as these included 92.4% of all pathways.

For fever, the most frequently mentioned pathway was to first treat at home. Another, less frequently mentioned first action was visiting a doctor (n=12; 11.4%). People differed in their choices when asked about HSB intentions in the case of dengue (Figure 1). Unlike fever, the majority (n=63; 60.0%) of individuals would directly visit a doctor, while a minority (n=27; 25.7%) would chose to first treat dengue at home. For dengue, differences were observed when comparing the intended first actions and pathways of children and adults. In case of dengue more adults than parents/guardians referring to children reported to first visit a doctor (66.7% vs. 52.9%; P=0.151), however children were taken earlier to the doctor than adults (mean number of days: 1.15 in children versus 1.43 in adults; P=0.074) (Figure 1). When analyzing the pathways to care, parents/guardians referring to children were found to report more frequently to first treat dengue at home and then visit a doctor compared to adults (35.3% vs. 16.7%; P=0.029). No differences were found when comparing the intended first actions and pathways between children and adults in case of fever.

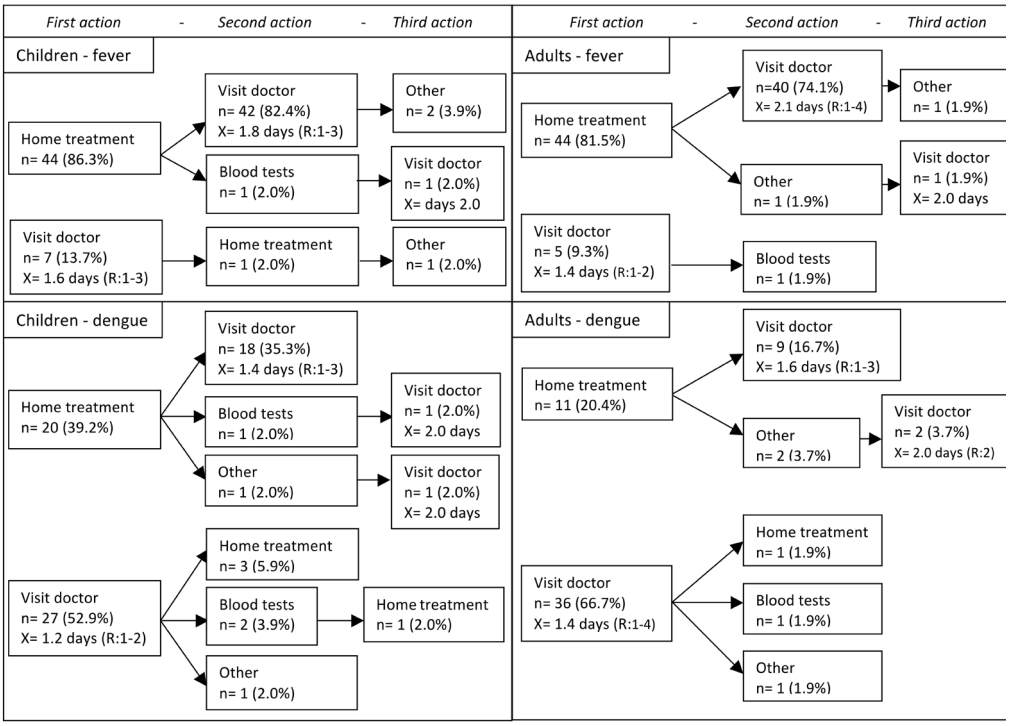


**Figure 1.- Pathways of health seeking behaviour of dengue and fever.** X= mean day when visiting medical doctor; R= range of days when visiting doctor (min – max).

The most common second action in case of fever was visiting a doctor. Less common second actions were treating at home, do a blood test and other (call a doctor, 'call my mother'). For most of the people (n=10) who intended to visit a doctor as their first action (n=12; 11.4%), this was also the last intended action. One of them would subsequently treat the fever, another one reported to intend to go to a laboratory for a blood test as a second action.

When referring to dengue, 'visiting a doctor' was mostly chosen as second action. Treating at home, do a blood test and other (do what the doctor says, 'call my mother' or call the dengue project staff) were mentioned less frequently. If a doctor would be visited as a first action, most people did not intend perform another action afterwards, with the exemption of four people who mentioned to subsequently treat dengue at home, three to perform a blood test and two to do anther action. For both fever and dengue, no differences in choice of second actions were observed when comparing adults and children.

In order to determine whether the intention to first treat at home would make people choose to go later to a doctor, we compared the day of seeking medical care from those

who would first treat at home with those who would take a different action. Those who intended to first treat at home reported a significant delay in their intentions to seek medical help versus those who did not, in the case of fever (mean day=1.92 vs. mean day=1.50; P=0.027) but not in case of dengue (mean day=1.52 vs. mean day=1.33; P=0.150).

We explored the influence of socio-demographic and socio-economic characteristics on HSB pathways by comparing those who would first treat at home with those who would first visit a doctor both in case of dengue and fever. There were no statistically significant associations of the different behaviours with the age of the interviewed person, religion, education, occupation, crowding of the household, income of the household or socio-economic status. However, those who would first treat fever at home had a higher degree of education (P=0.053) and the households of those who would first go to a doctor in case of dengue had a higher income (P=0.073).

## 3.4. Home Treatment

Overall, 90 (85.7%) individuals stated they would treat fever at home while only 38 (36.2%) would take this decision in the case of suspected dengue infection (P<0.001). Paracetamol was the most common chosen home treatment overall while taking a cold bath/shower and oral rehydration were the second most common types of home treatments in the case of fever and dengue respectively (Figure 2). Within the people who reported to treat fever at home at any time during their health seeking decision process, most would use paracetamol (n=86, 95.6%) to lower the temperature, followed by a cold bath/shower (n=31, 34.4%), oral rehydration (n=8; 8.9%), body sponging with a wet compress or sponge (n=7; 7.8%) and other ways of home treatment (n=7; 7.8%) such as rubbing the body with alcohol/cream, aspirin, other medication or rest. Paracetamol was also the most common choice among those who would treat dengue at home (n=30; 78.9%), however, the use of oral rehydration (n=9; 23.7%) was cited more frequently than in the case of fever, opposite to the use of a cold bath/shower (n=7; 18.4%). Other (n=2; 5.3%) home treatments for dengue included body sponging or rest. Combinations of home treatment for fever and dengue are shown in Figure 2.

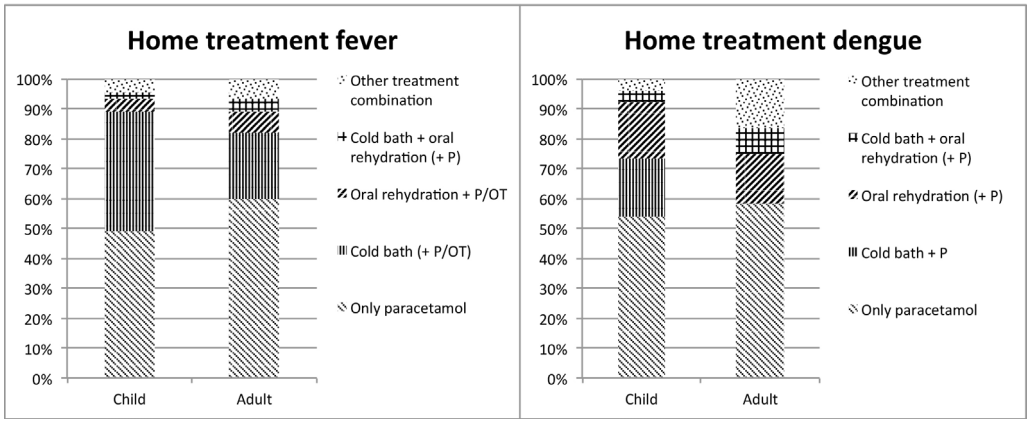


**Figure 2.- Home treatment choices for fever and dengue.** The categories of treatment combinations in fever and dengue are equal. However, reporting to treat at home with a 'paracetamol' (P) and 'other treatment' (OT) varies within categories home treatment of fever and dengue. If home treatment 'P' and/or 'OT' can either be present or not, they are placed within brackets behind the corresponding category.

Treating fever at home with a cold bath/shower was reported more frequently when referred to children compared to adults both in the case of fever (n=12; 26.7% vs. n=19; 42.2%; P=0.120) and dengue (n=6; 23.1% vs. n=1; 8.3%; P=0.276). The other choices for home treatment showed no difference between children and adults.

## 3.5. Day When Seeking Medical Help

If people reported to seek medical help when they/their child would have fever or suspected dengue, they were then asked on which day after onset of first symptoms they would visit the doctor. Most parents/guardians of children and adults would look for medical help on day 2 after fever onset, but when dengue was suspected most people would go on day 1 to the doctor (Figure 3). Parents/guardians would take their children earlier to the doctor in case of dengue than in case of fever (mean: 1.30 days vs. 1.78 days; P<0.001). Referred to adults the mean reported day was 1.47 in case of dengue and 1.96 in case of fever (P<0.001). Although children would visit the doctor earlier than adults, this difference was not significant in the case of fever (P=0.206) nor for dengue (P=0.162).

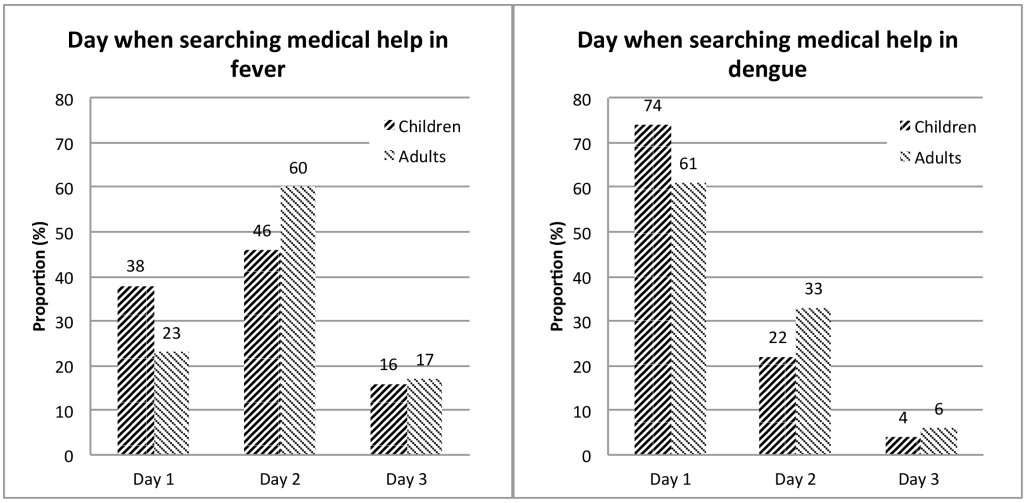


**Figure 3.- Intended day when interviewees would seek medical help in case of fever and suspected dengue.** Day when parents/carers of children (left figure) and adults (right figure) would visit the doctor in case of fever or suspected dengue.

## 3.6. Reason for Visiting a Doctor in Suspected Dengue

The most frequent reported reasons that prompted individuals to visit a doctor in suspected dengue were the appearance of new symptoms (n=81; 77.1%), the degree of the temperature (n=78; 74.3%) and the persistence of fever (n=35; 33.3%). Almost 10% of the people stated 'Dengue is a severe disease' as a reason to seek medical help. The most frequent symptoms mentioned were headache (n=36; 34.3%), corporal pain (n=32; 30.5%) and weakness (n=27; 25.7%). Other typical dengue symptoms were mentioned less frequently: rash (n=18; 17.1%), vomiting (n=11; 10.5%), eye pain (n=9; 8.6%) and muscle pain (n=1; 1.0%). Moreover, warning symptoms were not frequently indicated as reasons to seek medical help in suspected dengue: vomiting (n=11; 10.5%), bleeding (n=9; 8.6%), abdominal pain (n=6; 5.7%). The mean temperature referred by interviewees was 39.4°C (range: 38.0°C - 42.0°C) while persistence of fever ranged between 1-4 days with a mean of 2 days. There were no significant differences when comparing the reasons to seek medical care in suspected dengue between children and adults. However, those who reported a previous dengue infection compared to those who did not were more likely to mention the appearance of new symptoms as a reason to look for medical help (n=29; 87.9% vs. n=49; 71.0%; P=0.060), and reported to go later to the doctor when fever persisted (n=13; mean day= 2.38 vs. n=19; mean day=1.63; P=0.004).

## 3.7. Pathways of Health Centres' Choices in the Case of Fever or Suspected Dengue

As described above and in Figure 1, nearly all individuals (n=104; 99%) would decide to obtain medical help at some point in time if they or their child(ren) presented fever or had a suspicion of dengue infection. Once this decision was mentioned, interviewees were asked where would they first seek medical attention and if they were not satisfied, to cite the next options in order of preference. The answers were summarized in a flowchart (Figure 4) showing only the health centres chosen of those who would first visit an ambulatorio or CDI as this reflect the choices for health centres for 88% of the total sample. The flowchart shows from left to right the first, and if applicable the second, third and fourth choice for health centres in case of fever and dengue. On the whole, 5 (4.8%) individuals would decide not to obtain medical care in case of fever, and one (1.0%) in case of dengue. They would instead treat the fever at home (n=3) or take no action (n=2). One individual with a 'doctor phobia' stated not to go to a doctor in case of dengue, but call his mother. As shown in Figure 4, both in case of fever (n=82; 78.8%) and dengue (n=84; 80.8%) the most frequent first choice of health centre was an ambulatorio. Other first choices of health centres in case of fever were a CDI (n=10; 9.6%) a private practice (n=4; 3.8%), an ambulatorio BA (n=2; 1.9%), and a private hospital (n=1; 1.0%). With respect to dengue other first choices were a CDI (n=9; 8.7%) hospital (n=4; 3.8%), a private hospital (n=3; 2.9%), an ambulatorio BAs (n=2; 1.9%) and a private consult (n=1; 1.0%). Tertiary health centres (private hospital and hospital) were mainly mentioned later in the pathways.

Individuals would go to tertiary level health centres (hospital or private hospital) more often in case of dengue (n=61; 58.7%) than fever (n=46; 44.2%; P=0.001). Also, a higher proportion of people (dengue: 40; 41.3% vs. fever: 29; 27.9%; P=0.001) reported to go at some point in time to a hospital in case of dengue.

There were no statistical significant differences observed comparing children with adults for their preferred health centres. However a hospital was mentioned less frequently when referred to children than to adults with respect to fever (18; 36,0% vs. 11; 20.4%; P=0.076) and dengue (n=24; 48.0% vs. n=19; 35.2%; P=0.185). The opposite was observed with respect to private hospitals, showing more adults than children who would visit a private hospital in case of fever (n=12; 22.2% vs. n=6; 12.0%; P=0.169) and dengue (n=14; 25.9% vs. n=7; 14.0%; P=0.130), although the differences were not statistically significant.

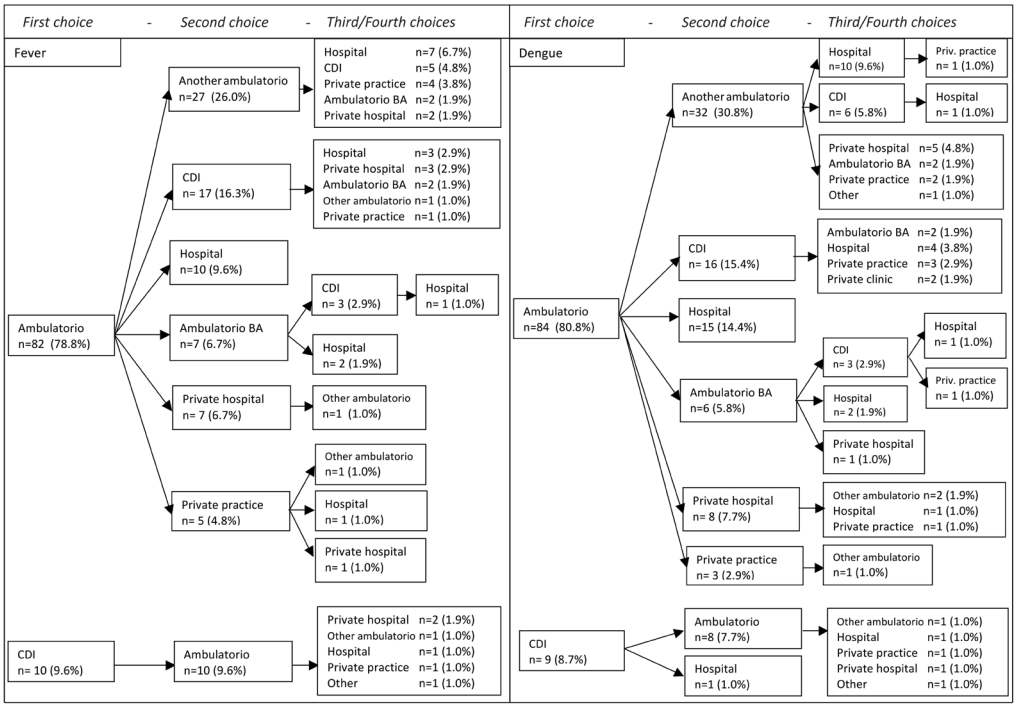


**Figure 4.- Flowchart of chosen Health Centres in case of have fever and suspected dengue.** The flowchart shows from left to right the first, and if applicable the second, third and fourth choice for health centres in case of fever (left side of the figure) and dengue (right side of the figure). CDI= "Centros de Diagnóstico Integral"; Ambulatorio BA= Ambulatorio "Barrio Adentro".

## 3.8. Reasons for Choosing Between Health Centres

To obtain a general overview of intention to attend health centres, we asked individuals at the end of the interview if they would visit any of the six health centres listed if they/ their children would have dengue. The great majority (98%) would visit an ambulatorio and a hospital (82%), while less people would visit a CDI (71%), a private consult (71%) an ambulatorio BA (67%) or a private hospitals (65%). All individuals were then asked to score the quality of the total dengue treatment of the selected health centres, with a range of one (very poor quality) to five (very good quality) in which a three was 'average' and an option to answer 'don't know'. The highest scores were given to private practices (mean = 4.5) and private hospitals (mean = 4.2). Hospitals were valued with a mean of 3.8, ambulatorios and CDIs with a mean of 3.7, ambulatorio BAs with a mean of 3.5.

Data on means of transport and travel time to the chosen health centres were obtained from the household questionnaire. Out of 88 individuals, most people reported to go walking to the health centres (n=70; 79.5%) as these are located in the vicinity of

their homes. Other means of transport were using a car (n=14; 15.9%), by bus (n=6; 6.8%), by taxi (n=3; 3.4%) or by motorcycle (n=3; 3.4%). The mean reported transport time to the health centre was 8 minutes, ranging from a mean of 3.0 minutes when motorcycles where used to a mean of 8.5 minutes for those who would go walking to the nearest health centre. The mean expected costs for a return trip to the health centre were 0 VEB for walking and 3 VEB when a car or motor were used, while the costs of a bus (mean=26 VEB) or taxi (mean= 43 VEB) were expected to be higher.

While ambulatorios were the most frequently chosen health centres, many people did not think the quality of care in these health centres was better than other health care institutions (see section 'Quality of care'). The main reason to give the quality of care of ambulatorios a lower mark was the absence of medicines/ infusions/ needles and other medical materials for treatment, which forced people to buy them in pharmacies. A 59 years-old woman with a university degree stated the following: *"The care given at the ambulatorio was good, but they (the medical/nursing staff) have no air conditioned, the door was left open, there was no alcohol, no syringes, no cotton. I had to buy everything myself."* Other disadvantages that were pointed out were the presence of many patients and long waiting times. Reasons for still going to an ambulatorio were logistic ('it's the nearest health centre'), behavioural reasons ('I am used to go to an ambulatorio') and reasons referring to quality ('they treat well', 'the doctors are good', 'there are good connections with the hospital for fast referring in cases of emergencies').

In general, the CDIs and ambulatorio BAs were appreciated for a good treatment, being situated near, having present medical supplies needed for treatment, nice buildings and a nice atmosphere. Therefore they were frequently mentioned to be visited for 'small health problems'. A housewife of 27 years old told the following: *"Barrio adentros (ambulatorio Bas) and CDIs provide a good care, in a nice atmosphere. You are treated fast. But I only go there for non-severe health problems. In case of dengue I would go to an ambulatorio. These doctors are the best."* CDI's and ambulatorio BAs were not frequently the first chosen health centres to visit in case of dengue. The principal reason mentioned for this was referred to the doctors working at CDI's and ambulatorio BAs: 'there are bad doctors', 'I don't trust the doctors/diagnosis', 'the doctors are not Venezuelan'. Others just told 'I don't like CDI's and ambulatorio BAs', without explaining this. Referring specifically to an ambulatorio BAs, people mentioned they would not search care for dengue in an ambulatorio BAs because there was no possibility for hospitalization. Some people would first visit an ambulatorio and subsequently a CDI or ambulatorio BAs, to receive a diagnosis from a doctor from the ambulatorio and after obtain the medical supplies needed from a CDI or ambulatorio BAs which were not present in the ambulatorio.

While many people reported they would visit a hospital in case of dengue, the quality

given to care in the hospital in case of dengue was not higher than the other health centres. Many interviewed persons mentioned similar advantages and disadvantages for dengue treatment when referring to hospitals as those mentioned for ambulatorios. While good treatment, the quality of doctors, the presence of specialists and the fast treatment of emergencies were appreciated, many people mentioned that the hospitals were too crowded, which prolonged the waiting times. Moreover, referring to hospitals many individuals pointed out the absence of supplies for medical treatment which obliged people to buy medical supplies themselves.

Appreciated about private hospitals was the 'excellent care' and the presence of specialists and medical materials for treatment. The mean quality of care given to private hospitals and private practices was the highest. A frequent mentioned reason to expect a good dengue treatment in private hospitals and practices was the assumption that 'if one has to pay for a treatment, then the care given is probably better'. However, less people reported to visit these health centres in case of dengue because many people could not afford the prices of this care. The ones who would go to private hospitals and clinics frequently mentioned to have an insurance. A father, living with his own child and a child which is not officially his told the following: *"When my own child falls ill, I call a private doctor who will come to my house and see my child. My insurance will pay the costs. But when the other child falls ill, I go to the ambulatorio, because in this case my insurance will not pay the costs."* However, there were also individuals who mentioned they did not want to spend their insurance on dengue treatment in private hospitals and private consults, because 'dengue treatment does not need a specialized centre'. Other reasons for visiting private practices were the 'good doctors'. Those who would go to a private practice frequently mentioned to know one of these doctors personally.

## 4. Discussion

In this study, we aimed to understand the health seeking behaviour and access to care of a population exposed to endemic dengue transmission. To this end, we conducted a cross-sectional household study within the third annual survey of a dengue community-based cohort study in three neighbourhoods of Maracay city, Venezuela. We showed that intended pathways to care differed for suspected dengue infection compared to fever, as well as for children and adults in case of suspected dengue. The majority of the participants sought medical care at primary health centres as a first choice. Furthermore, participants appeared to have a medium to good knowledge on dengue and most felt at risk of dengue. In case of fever, the majority of the people would treat at home before paying a visit to a doctor. This intended pathway for fever agrees with the findings of studies in Colombia (30) and Cambodia (12), where the majority of dengue infections were first treated at

home, since a dengue infection is probable to present with fever as a main symptom. In case of suspected dengue, on the contrary, most individuals reported they intended to seek medical care as their first action. Moreover, a suspected dengue infection would make people seek medical care earlier than in the case of fever. The earlier seeking of medical help in case of dengue suggests that dengue is in general perceived as more severe than fever. This is in agreement with a study in Brazil where patients with dengue were found to seek medical care significantly sooner than patients with other febrile illnesses (31). Our findings also support that a dengue infection results in more medical care seeking behaviour compared to fever from other causes, as suggested in a previous study (19). Interestingly, when individuals were faced with a fictitious possibility of a dengue infection parents or guardians were more likely to report that they would treat their children at home before visiting a doctor compared to adults. Although adults reported more frequently to first visit a doctor, they chose to seek medical help later than parents/guardians of children. In contrast, a study in Brazil found that young people experienced a longer delay in care-seeking than adults, which was attributed to the difficulty in diagnosing dengue in young people (17). Overall, a high temperature of fever and the appearance of new symptoms were the main reasons that would make the participants visit a doctor in case of dengue. This is in line with previous studies, where perceived severity of the condition of a child sick with dengue was found to influence the selection of a therapeutic option (12, 30).

In the current study, it appeared that participants with a higher education treated fever more frequently at home, though the association was not significant. Practicing home treatments in case of dengue is described to be associated with a higher education in Thailand as well (32). Despite the fact that no significant associations were found between socio-economic markers and choices made in HSB in case of dengue or fever, caution must be taken when interpreting the results, since socio-economic status was significantly lower in the child sample. This difference in socio-demographic and socio-economic characteristics between the adults and parents/guardians of children can be attributed to the fact that almost half of the children in Aragua State, Venezuela, are part of a household run by a single mother, who have generally a lower degree of education and a lower income (33). This could have influenced the intended HSB, since in previous studies socio-economic status was found to influence HSB (12, 18, 32).

In the present study it was found that in the case of dengue, individuals intended to seek medical care earlier than in the case of fever. It is conceivable that a timely care-seeking may be achieved when people are able to self-diagnose dengue. In self-diagnosis, recognition of symptoms plays an important role. Different degrees of dengue knowledge are described in previous studies (12, 21, 30, 34). In our study, participants showed medium to good knowledge about dengue, where for most people knowledge

on dengue transmission tended to be broader than knowledge related to the symptoms of the disease. Among the participants, fever and headache were the symptoms most frequently associated with dengue. Similar results with regard to symptom recognition were found in previous studies in Mexico and Laos (34, 35). The difference in knowledge on dengue transmission compared to dengue symptoms can be explained by the fact that dengue fever is a complicated disease with a great variation in expression of symptoms, while the transmission routes are relatively uncomplicated and thus easier to understand. Moreover, dengue campaigns in the Venezuelan media are mainly focusing on eradicating the vector of dengue. This emphasis on vector eradication in anti-dengue campaigns is also observed in a study in Malaysia (21). Nonetheless, in a survey in Caracas, Venezuela in 1993, knowledge on dengue transmission was found to be rather poor, with less than half of the people being aware of the origin of a dengue infection. In the light of our results, this suggests an improvement of the general knowledge of dengue in Venezuela (36). In our study, people mentioned multiple different sources of information about dengue, implying that dengue is a major problem for society in Venezuela. Moreover, we found that exposure to a higher number of information sources raised the individuals general knowledge on dengue.

Several studies describe home treatments used in dengue which vary according to country or region. These include herbs and over-the-counter medicines such as paracetamol (12, 34), and liquids such as water (34) carbonated isotonic sports drinks, fruit and vegetable juices and frog or crab soup (21). We found that fever was treated at home most frequently with paracetamol or a cold bath, while dengue was treated at home principally with paracetamol or oral rehydration. This is in line with our expectations, because in Venezuela, a cold bath is widely used to lower the temperature when having fever. The finding that rehydration is frequently mentioned as home treatment indicates that the participants were aware of how dengue is treated, since rehydration is an important part in dengue treatment. When seeking medical care, primary health centres were the first and second choice for the vast majority of the participants, regardless if it concerned suspected dengue or fever, and choices were the same for both children and adults. However, when comparing suspected dengue and fever, a higher proportion of people would attend a hospital or a private hospital in case of dengue. This might indicate that the participants perceive dengue as a disease that needs specialized treatment and therefore choose tertiary health centres above other health centres. Indeed, dengue was found to lead to more hospitalizations compared to fever from other causes in a previous study (18, 19). We found that almost all participants would attend a public health centre in case of dengue at some point in the course of the disease. In Asia it was found that many people would not attend official health centres in case of dengue (3). It is possible that cultural differences influence these choices. Another possibility is

that the difference is due to the hesitation the participants might experience in reporting intended visits to unofficial health centres. In our study, individuals reported a number of different health centre types they intend to attend in the case of a dengue infection, where the Ambulatorio was the most frequently mentioned. This is consistent with results from Malaysia, where primary health centres were the first choice of treatment-pathways (22). Various reasons were identified for choosing a particular health centre, the main factors that influenced the choice were good experiences at health centres, proximity of health centres to the home, absence or presence of medical materials, absence or presence of confidence in the doctors, and whether or not people had to pay for the given care. In another study, confidence in the provided care and costs are also reported to influence the type of care that is chosen (12). Despite complaints about the quality of care, the vast majority of the respondents would first attend primary health care centres. This stresses the importance of adequate care at this level. The majority of the participants felt that they or their children were at risk of dengue. The presence of mosquitoes in the living environment was the main reason for individuals to feel they or their children were at risk. Similar results were found in Asia, where the absence of mosquitoes was associated with a decreased risk perception in individuals (21). People with a reported previous dengue infection felt more susceptible to dengue and were more likely to take preventive practices against mosquitoes. Measures of protection against mosquito bites were widely used among the participants, where repellents and insecticides were by far the most frequently mentioned as was also found in a study in Asia (34). Evidence of differences in health beliefs and practices in people with a previous dengue infection was also found in a focus group study in Puerto Rico, where participants with previous dengue infection were more concerned about susceptibility to dengue and supported the use of repellents to avoid mosquito bites more than their counterparts (23).

For some comparisons, such as choice of health centre and influence of a previous dengue infection on HSB, the sample size of the current study was too small. However, a strength of the study was that data was collected from a well characterised cohort study population of which socio-economic and epidemiological data was available. Moreover, contrary to hospital-based studies, our study design made us able to include people who would avoid attending health centres, thus obtaining insight in their intended HSB too. Besides, people were interviewed in their own houses, providing a safe and confident environment. Quantitative and qualitative data were combined in the current study, which provides an in-depth insight in HSB, but is not done often. Lastly, the influence of a past dengue infection on HSB was assessed as well, which is not often done earlier.

In this study, HSB and knowledge on dengue seems to be influenced by a reported

past dengue infection. It is important to investigate this potential influence, since doctors can intervene in this easily by providing dengue patients with adequate advice on how to act in a next dengue infection. In the current study, we were able to describe intended HSB in case of dengue and fever. Comparing these results with the results of health centre based HSB studies, would make it possible to also reveal the barriers for achieving the intended HSB. Therefore, more community and health centre based studies should be performed to achieve a wider view and stronger conclusions on HSB in people exposed to dengue in the Americas. The difference in HSB between fever and dengue found in the current study implies that unless people know that they may have dengue, their HSB would follow the one described for fever.

## 5. Conclusion

The present study showed that intended pathways to care differ for suspected dengue infection compared to fever, as well as when comparing intended actions for adults and children in case of dengue. A suspected dengue infection would make people seek medical care earlier than in case of fever which implies that dengue is perceived as more severe than fever. High fever and the appearance of new symptoms were the main reasons that would make the participants visit a doctor in case of dengue. The differences in HSB between fever and dengue imply that unless people know that they might have dengue, their HSB would follow the one described for fever. The early intended medical care-seeking in case of suspected dengue suggests a possible improvement of HSB if a tool can be designed to diagnose dengue at home. Despite of complaints, the vast majority of the respondents would first attend primary health care centres. This stresses the importance of adequate care at this level. When comparing suspected dengue and fever, a higher proportion of people would attend a tertiary health centre in case of dengue. More community- and health centre based research on HSB in dengue is needed to provide a better understanding of HSB and identify barriers in HSB of those who have a dengue infection.



## 6. Author Contributions

JE designed the study and the questionnaire, coordinated and carried out data collection, performed the statistical analysis, interpreted the data and drafted the manuscript. EFL participated in the design of the study and the questionnaire, assisted in the coordination of the study, carried out interviews and data collection, and interpreted the data. MFV participated in the design of the study and the questionnaire, assisted in the coordination of the study, carried out interviews and data collection, and interpreted

the data. MS participated in the writing of the manuscript and interpreted the data. ZIV participated in the design of the study, writing of the manuscript and interpreted the data. LA participated in the design of the study, data collection. AT conceived, designed and coordinated the study, participated in the data collection, analysis and interpretation of the data, and the drafting and critical revision of the manuscript. All authors critically revised the manuscript.

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